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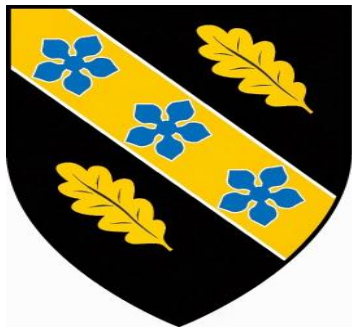
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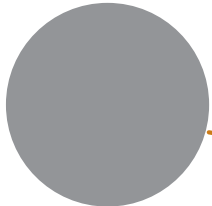


# UWTSD Research Seminar

Dr Nagham Saeed

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School of Computing and Engineering

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# Presentation layout

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- About UWL
- WinSTEM group and WiEEE society
- SENLOCDA Research Group.
- My research background
- My current research
- My research interests.

# About UWL

The University of West London is ranked as the **top modern university\* in London, 8<sup>th</sup> modern university\* in the UK** and ranked as the **50<sup>th</sup> university nationally by the Guardian University Guide 2019**.

**98%** of our graduates are in employment or further study within six months of graduation\*\* and they achieve the second highest starting salaries of all the London modern universities.



St. Mary  
Campus

# St. Mary Campus Heart Space



# WinSTEM Group



WInSTEM is a group of academics in the School of Computing and Engineering at UWL. We have a passion for encouraging women and girls to pursue careers in Science, Technology, Engineering and Mathematics (STEM), and particularly our own specialist areas of engineering and technology.

# Taking inspiring WinSTEM message into local schools and Colleges



# UWL Women in Electrical/ Electronic Engineering

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# SENLOCDA Research Group

## Aim

Sensing, Localisation & Contextual Data  
Analytics for Smart Industrial Services

**SENLOCDA for  
Smart Industrial  
Services**



# SENLOCDA research group members



Professor Xinheng (Henry)  
Wang  
Professor of **Computing**



Dr Wei Jie  
Associate Professor in  
**Computing**



Dr Massoud Zolgharni  
Senior Lecturer in **Computer  
Vision**



Dr Kourosh  
Behzadian  
Senior Lecturer  
in **Civil  
Engineering**



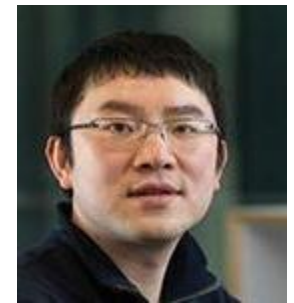
Dr Nagham  
Saeed  
Senior Lecturer  
in **Electrical  
Engineering**



Dr Ying Zhang  
Senior Lecturer in  
**Computer Science**



Dr Chekfoung Tan  
Lecturer in **Applied  
Project  
Management**



Dr Liang  
Chen  
Lecturer in  
**Cyber  
Security**

# Smart Trolley by Henry Wang

Smart trolley is an **integrated platform** to provide smart services to passengers and airport operators. Its services are supported by following underlying technologies: indoor localisation and navigation, IoT, cloud computing, big data analytics, artificial intelligence, and batch charging of the trolleys.



## Service provided

- **Indoor positioning**
- **Entertainment programmes**
- **Boarding reminder**
- **Charging mobile devices**
- **Shopping**

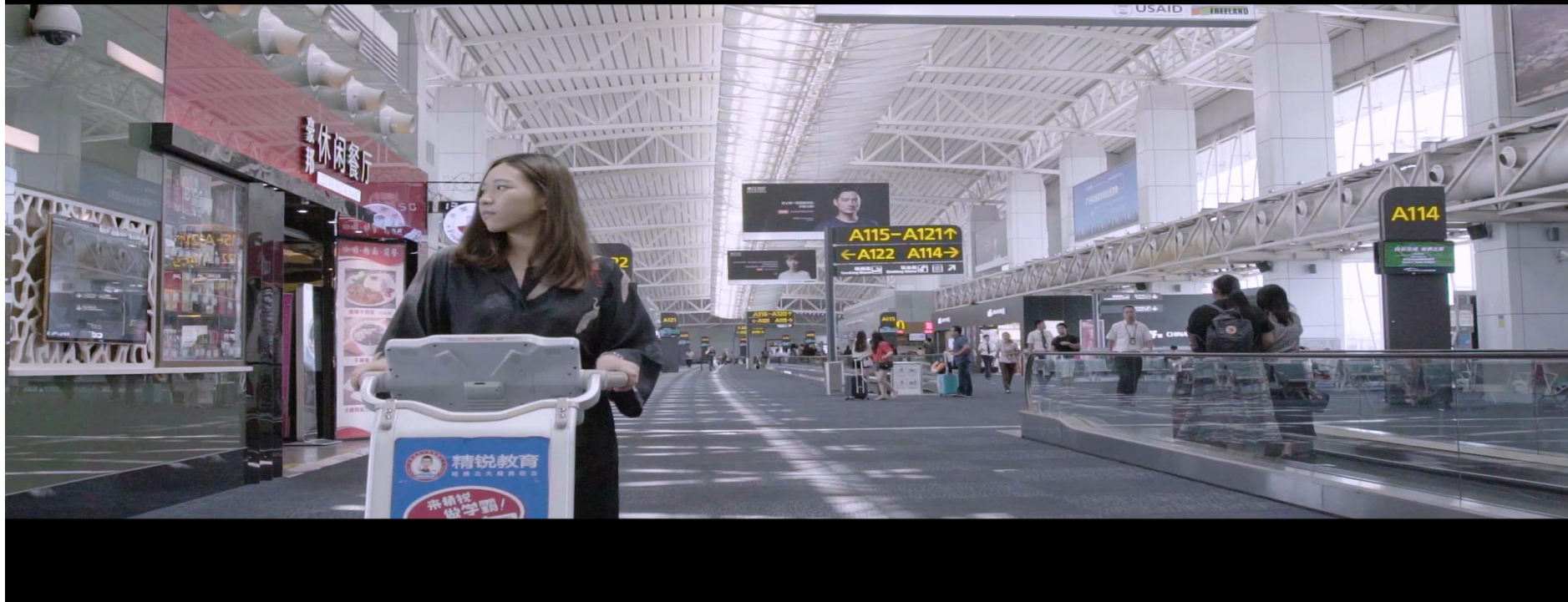


# Smart Trolley in Airport



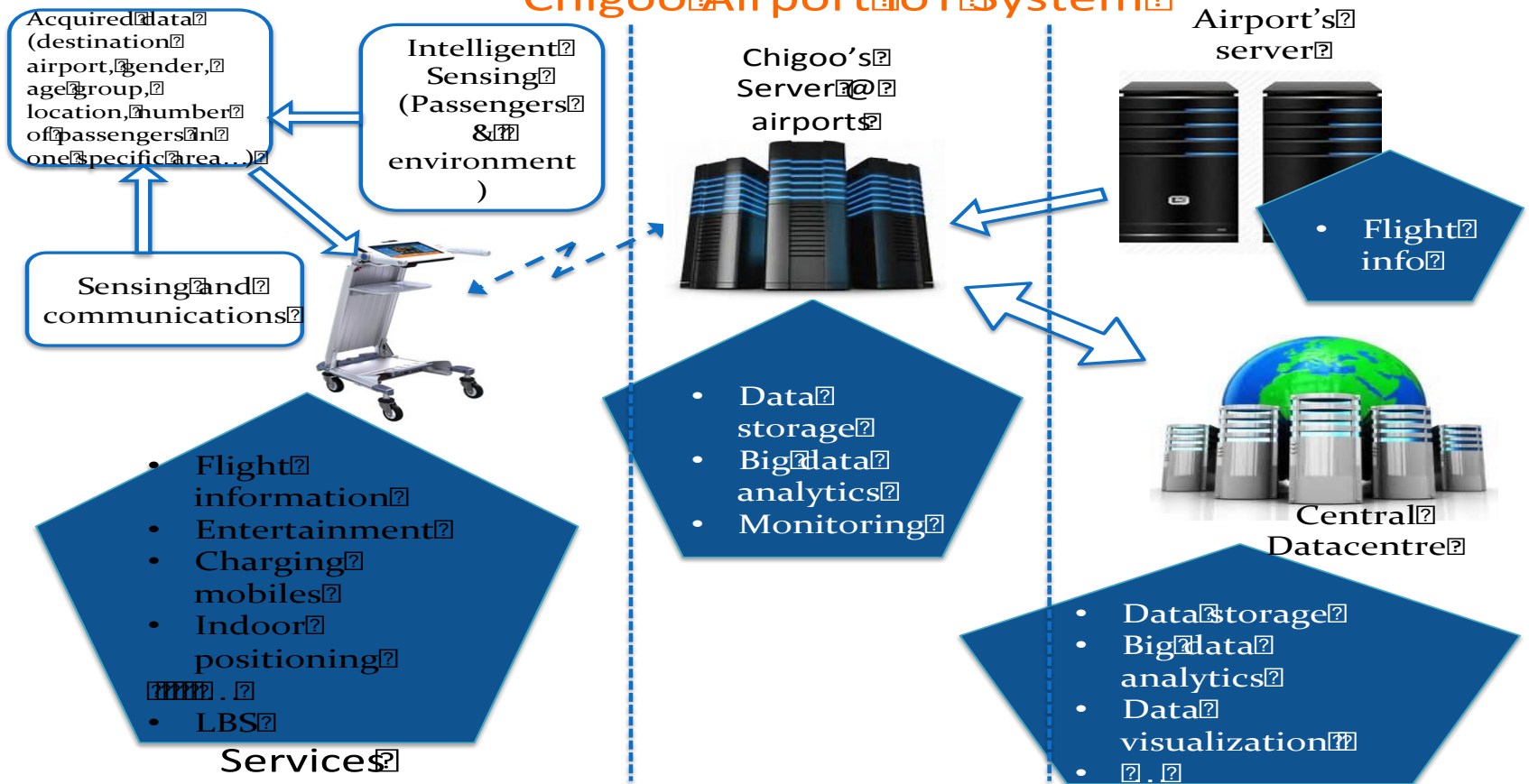
# Smart Trolley in Action

cTrolley™



# Smart Trolley's Underlying Technologies: Cloud, IoT and LBS

## Chigoo Airport IoT System



Airport's server



• Flight info



Central Datacentre

- Data storage
- Big data analytics
- Data visualization
- . . .

# Research Background –IMAN

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## Motivations :

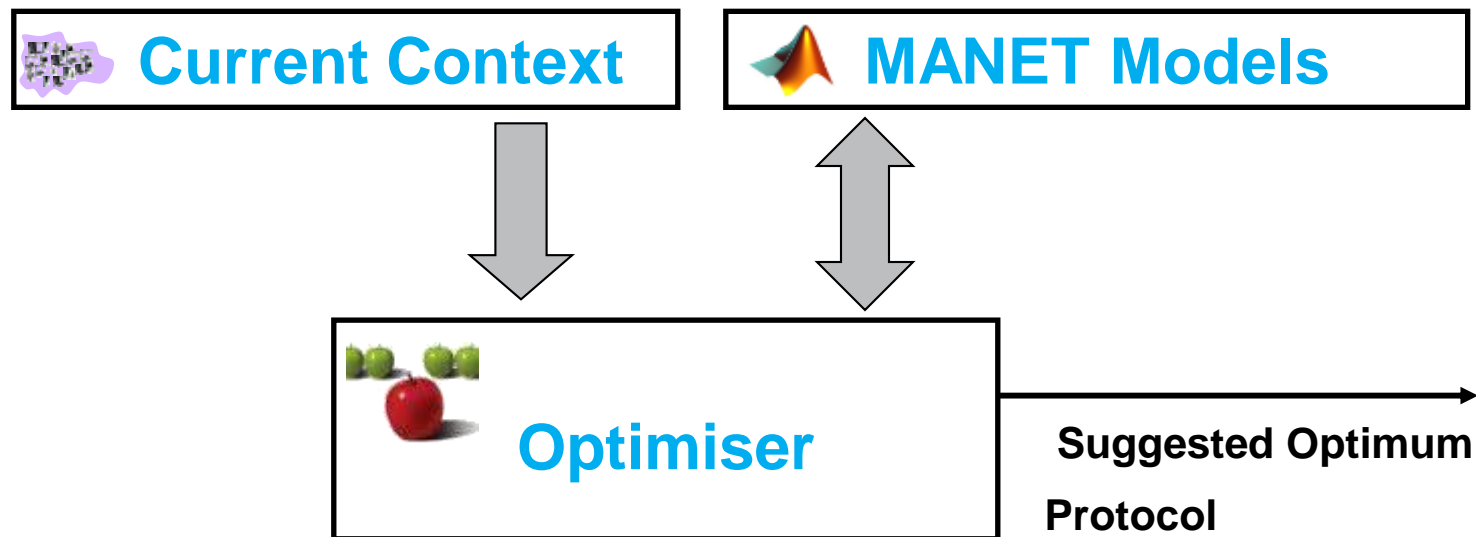
- Achieved **better communication** with Mobile Ad Hoc Network.
- Analyse MANET routing protocols **performance in different contexts**
  - **No** optimum routing protocol can handle all expected network contexts changes without the network performance been degraded.
  - Each identified routing protocol **addresses the objectives** of its development.
  - During a MANET life cycle, only **one routing protocol** can be utilised.

## Main Research Aim :

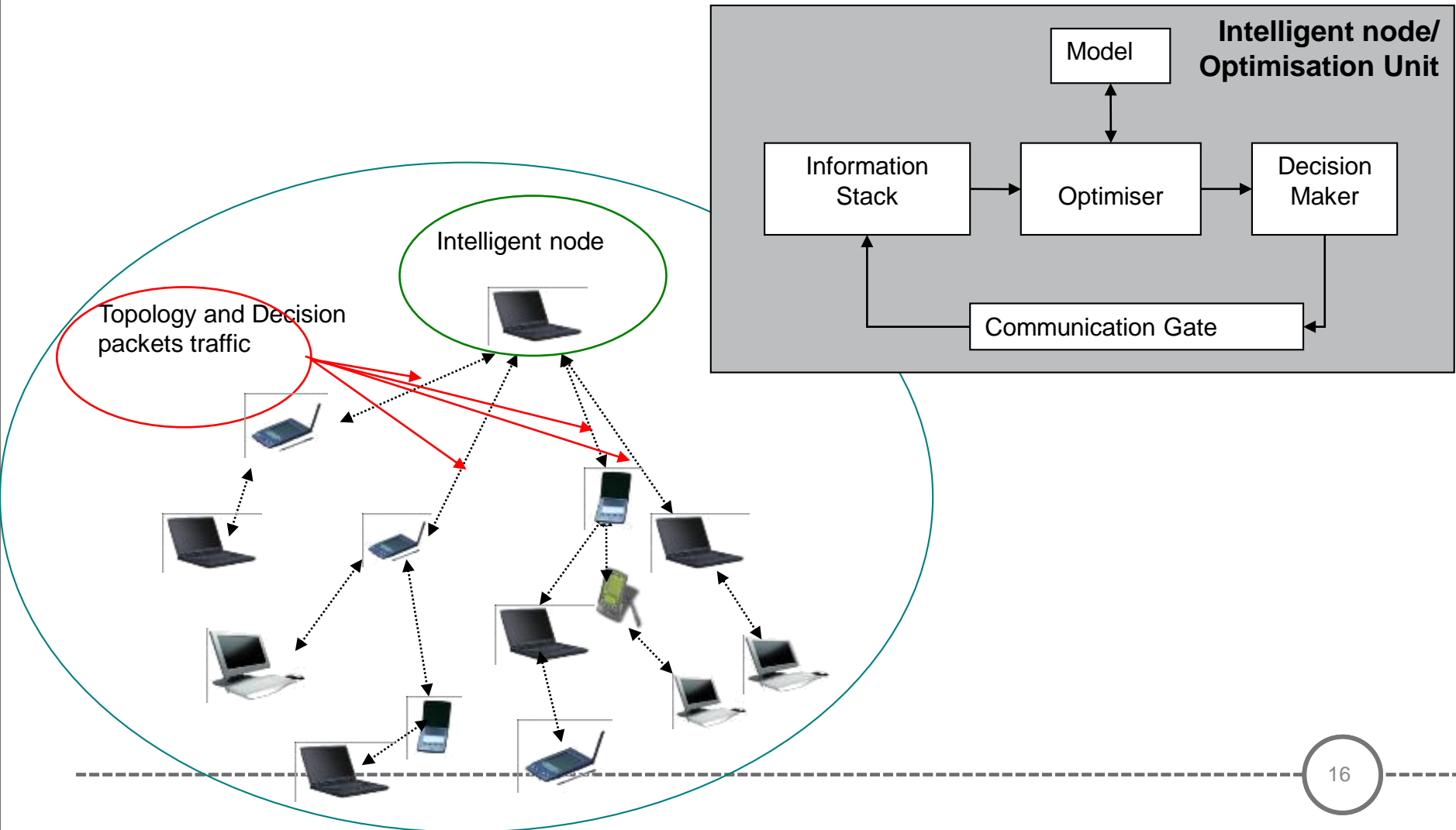
- Study the **communication challenges** in Mobile Ad Hoc Network (MANET) .
- **Design and Simulate** an adaptive system that learns from past experiences. Intelligent MANET Routing Protocols Optimization System that selects the most optimum routing protocol based on current network context.

# IMAN

## (Intelligent Mobile Ad Hoc Network)



# Intelligent Node in MANET

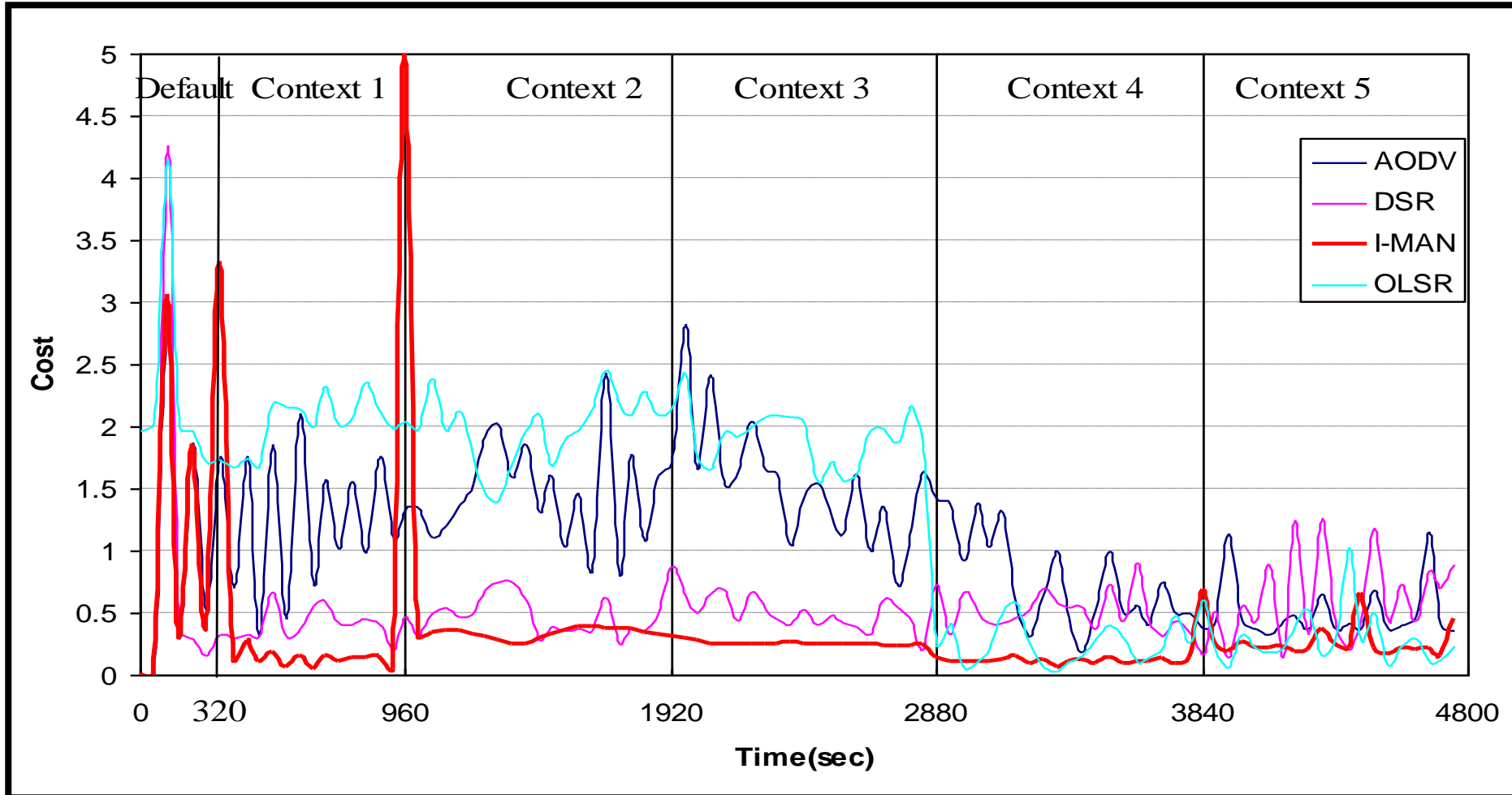


# I-MAN Optimal Selection

**Table 1 I-MAN Optimal Selection**

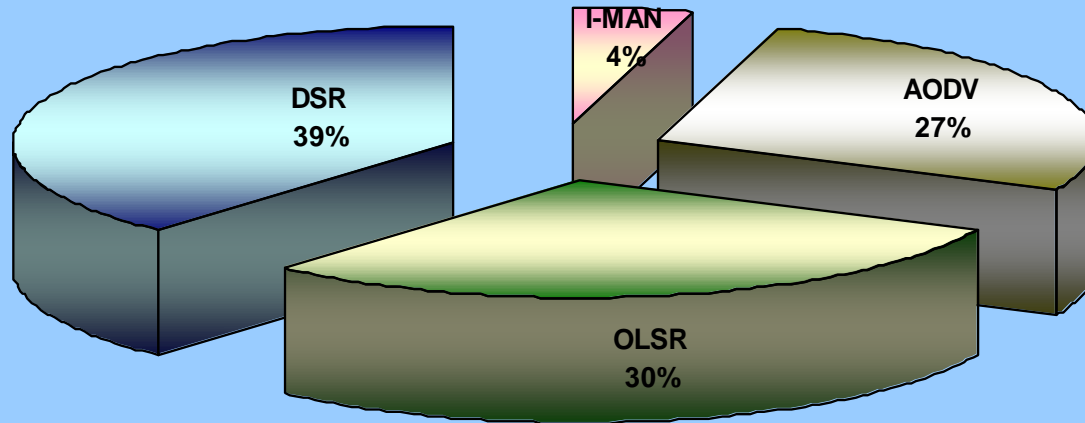
Case	Previous routing protocol	Time (sec)	Current Context		Optimal settings
			No. of nodes	Mobility (m/s)	I-MAN protocol
default	---	0-320	16	4	AODV
1	AODV	320-960	16	4	DSR
2	DSR	960-1920	55	4	OLSR
3	OLSR	1920-2880	55	9	OLSR
4	OLSR	2880-3840	21	9	DSR
5	DSR	3840-4800	21	17	AODV

# Cost Comparison



Cost = data drop + delay + load + R.A. + (1-Throughput)

# Cost Percentage Chart



# Current research

## 1. IoT Intelligent Supervision System in Oil Pipelines Grid

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### Motivations :

- Appreciate the oil pipelines transmission process through **visual simulation from source to destination**.
- Provide **visual monitoring system** for the transportation process.
- **Reduce** the waste in resources.
- **Evaluate and analyse the parameters** affecting oil pipelines transmission grid.
- **Enhance the security** of the oil transportation process. The project aims to involve the latest technologies and minimise reliance on the human workforce.

### Main Research Aim :

**Design and simulate** a user-friendly Intelligent control and monitoring system for oil pipelines grid to decrease environmental and financial losses whilst achieving better communication.

The main factors of improvement can be: **better quality of service, reduced losses in products and resources (such as equipment, devices and manpower) and reduced damage to the environment.**

# Why Supervision System in Oil Pipelines Grid?

- The **security** of oil transportation through pipeline grids is a high priority.
- For example, after 2003, the Iraqi government was no longer able to provide sufficient security. One of the areas most affected were the oil pipelines. The unsecure conditions created a golden opportunity for oil theft and intrusion.



**Oil stealing point discovered after one year in Karbala province 2015**

## Bombed pipelines near the water supply, river Tigris



**Tigris oil spill pollutes Iraq's water supply  
2014**

# Why Internet of Things and Artificial Intelligence?

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- The **reliability** of IoT allows the user to gain useful data to satisfy the needs, analyse health, gain the direction, achieve better communication and have a higher accuracy percentage. In this research, the Internet of things were the **pressure and volume** sensors near the valves and pumps.
- Nowadays, AI has proven its **effectiveness** in many disciplines and therefore Neuro-Fuzzy (NF) will be used as the prediction tool in the system.
- The project proposed to **blend** Internet of Things (IoT) with artificial intelligence (AI) to create a **knowledge-based system** to monitor and supervise oil transportation through the pipeline grid.
- Apply an **IoT intelligent system** in oil pipeline transportation grids to decrease environmental and financial losses whilst achieving better communication.

# Neuro-fuzzy Supervision System Stages

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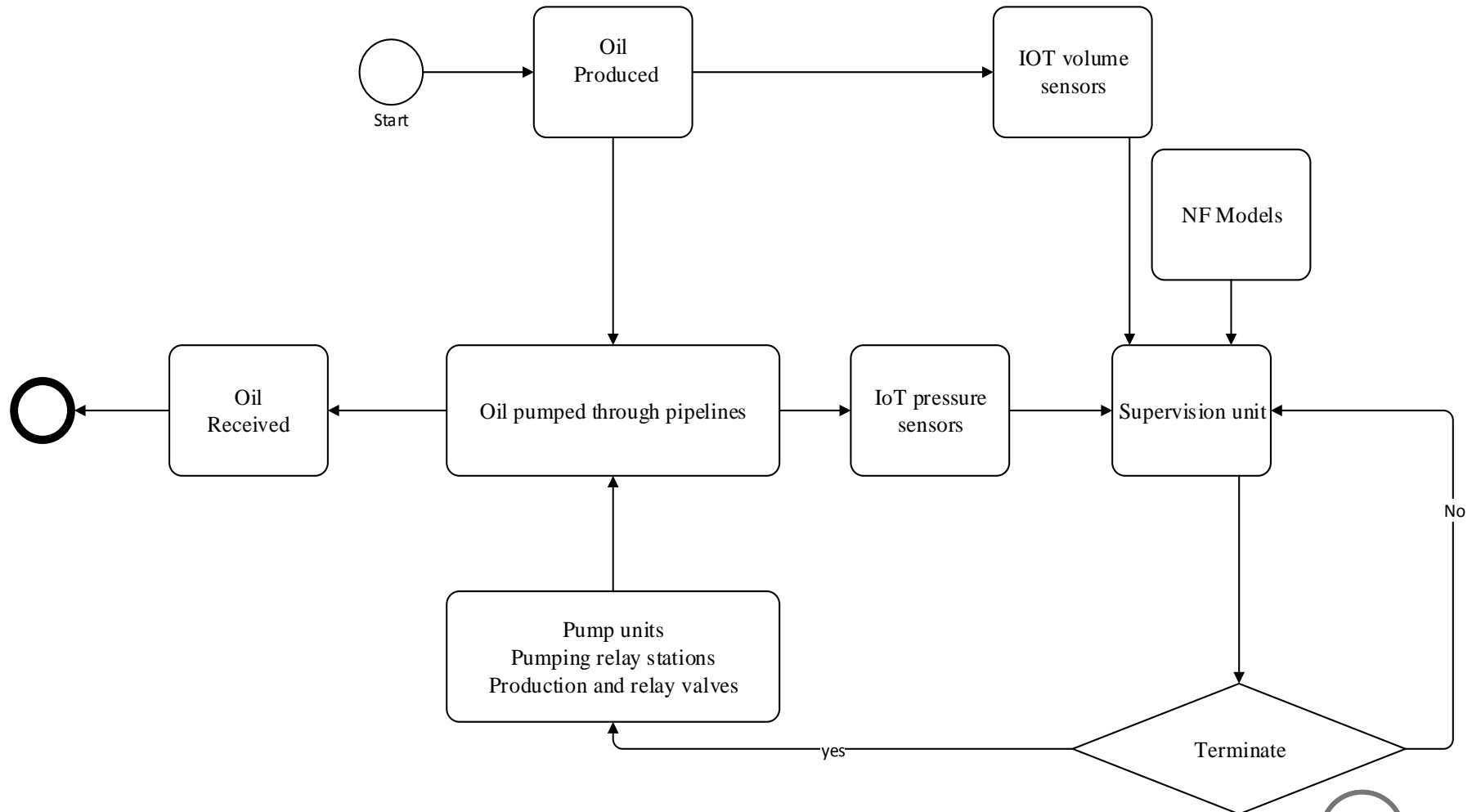
Three stages are proposed to develop the final simulated supervision system, they are:

- stage one; Neuro-fuzzy Supervision System
- stage two; Hierarchy Neuro-fuzzy Supervision System
- stage three; IoT Hierarchy Neuro-fuzzy Supervision System.
- The first phase showed **promising** results, while work will continue with the other two phases.



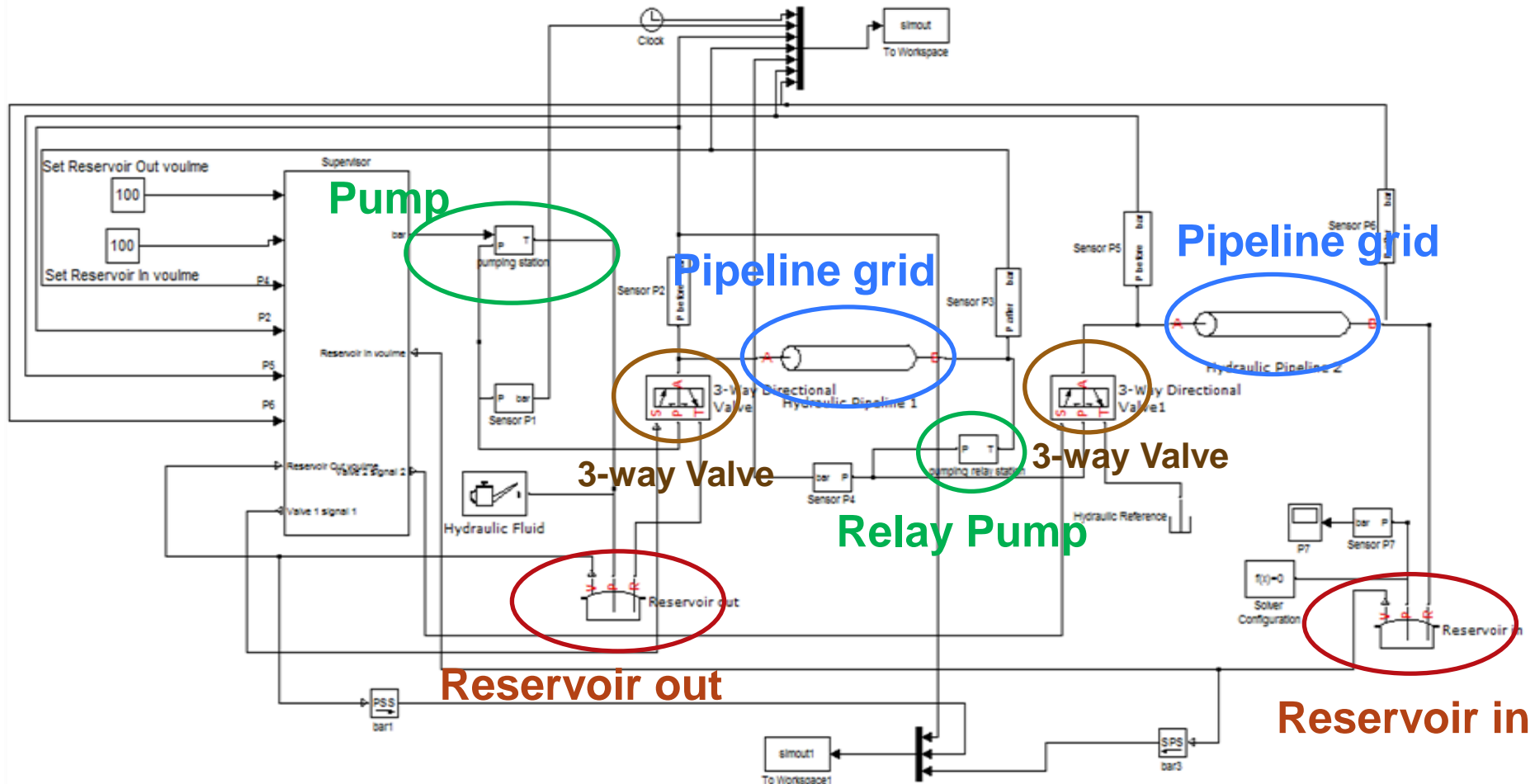
An Iraqi oil refinery worker fixes a small leak in the Iraqi-Turkish oil pipeline in Kirkuk

# Neuro-fuzzy Supervision System in Oil Pipelines Grid Flowchart

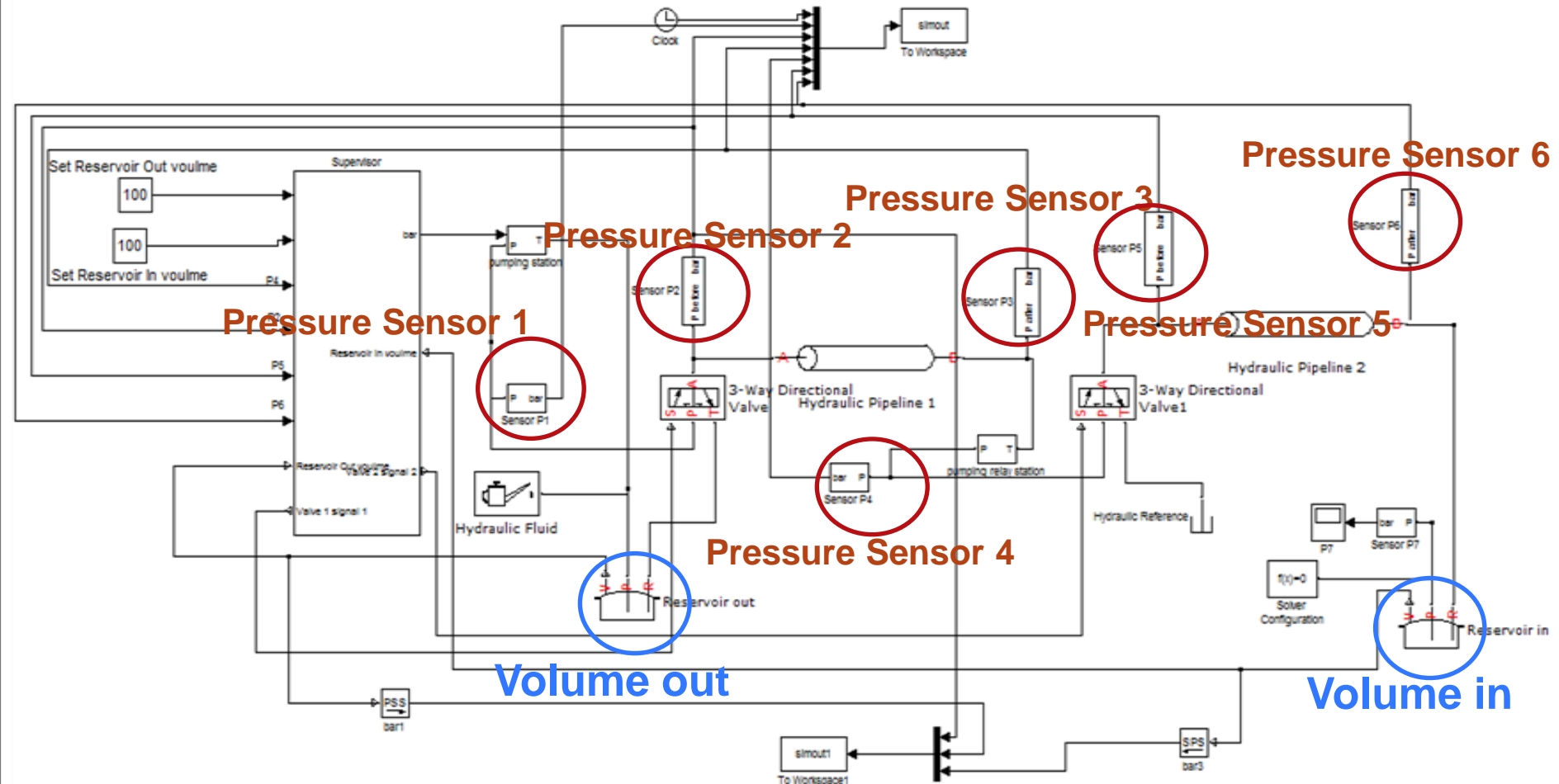


# Stage One:

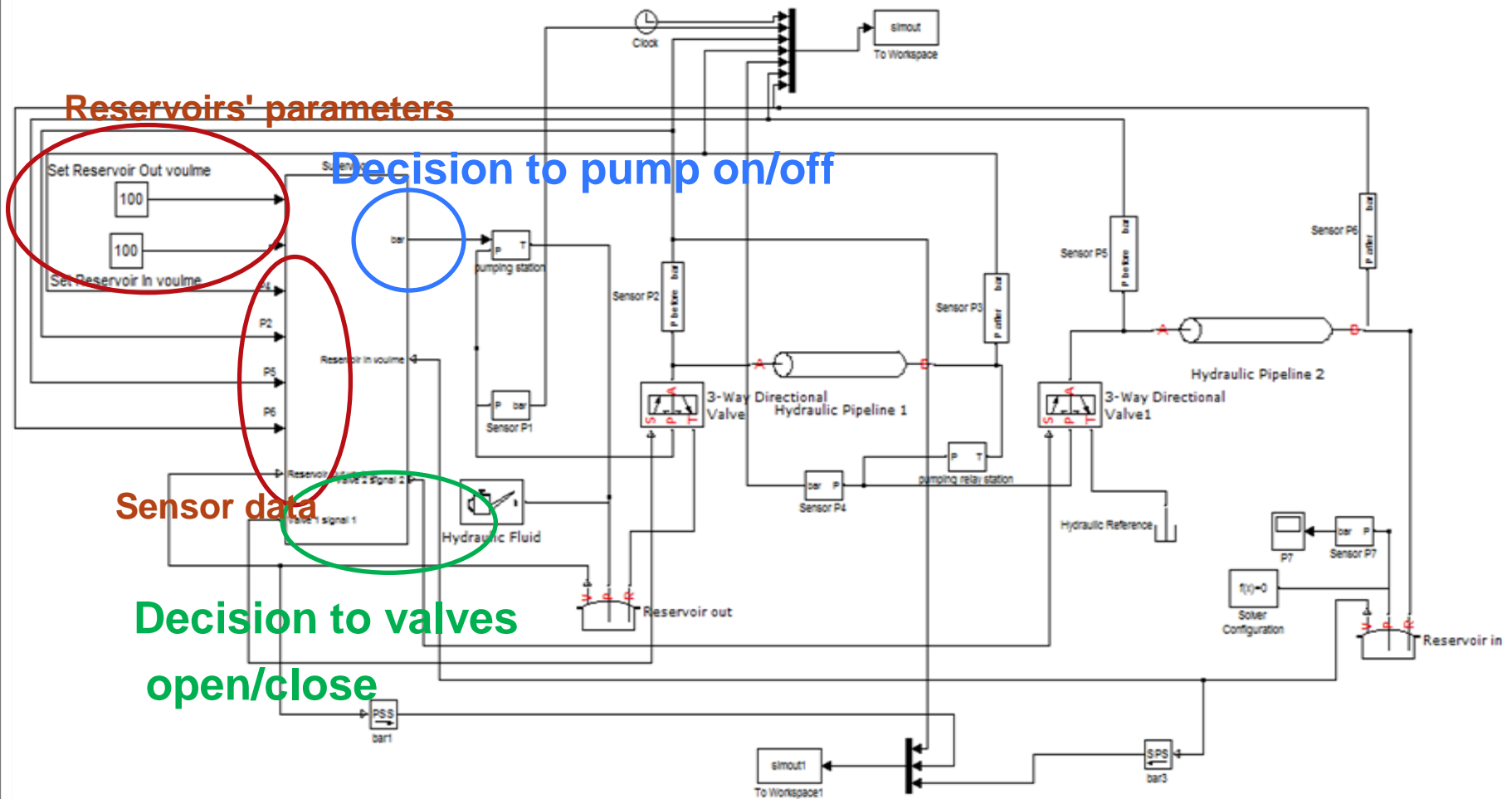
## Process (Physical Subsystems)



# Stage One: Sensors



# Stage One: Control System



# Simulation Setting

**Table 1. Normal condition simulation parameters**

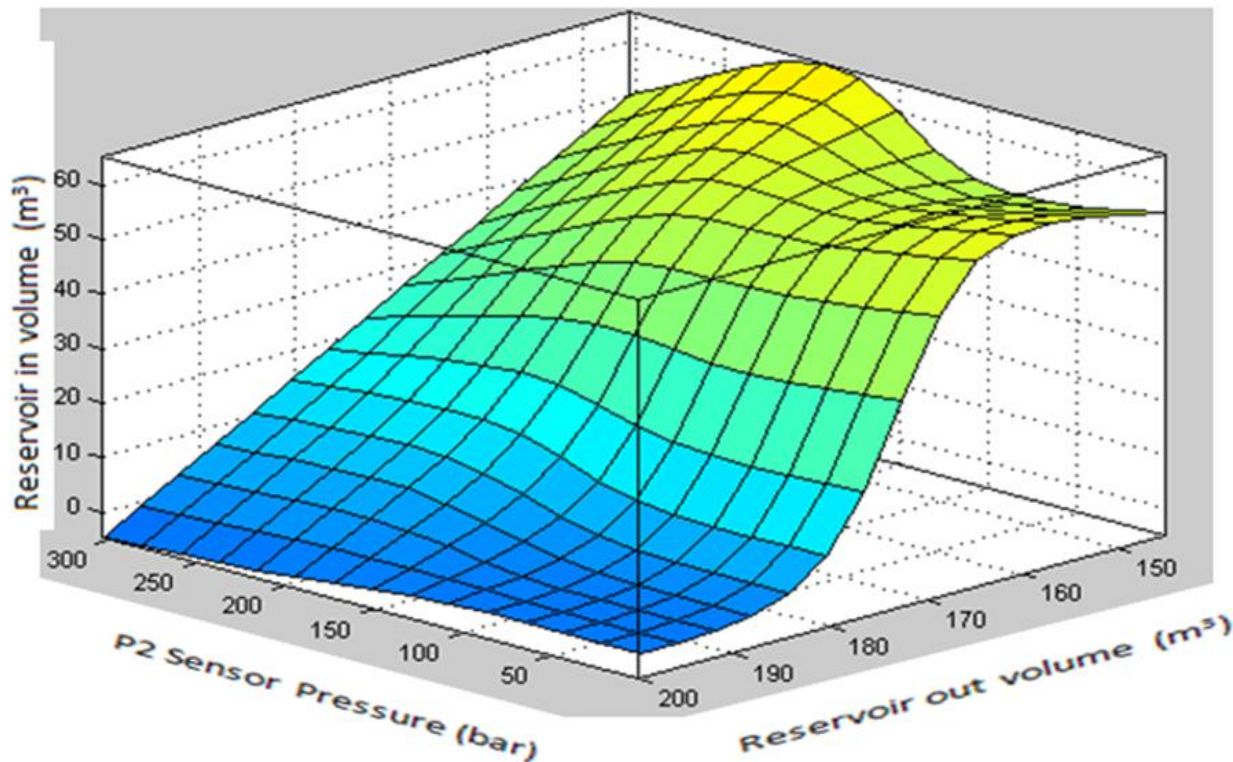
Simulation parameters	
<b>Reservoir out</b>	Vol <sub>out</sub> (set) 100 m <sup>3</sup>
	Vol <sub>out</sub> (initial) = 200 m <sup>3</sup>
	Pressurization level= 0
	Return line diameter = 0.02 m
	Pressure loss coefficient in return line = 1
<b>Reservoir in</b>	Vol <sub>in</sub> (set) = 100 m <sup>3</sup>
	Vol <sub>in</sub> (initial) = 0.02 m <sup>3</sup>
	Pressurization level = 0
	Return line diameter = 0.02 m
	Pressure loss coefficient in return line = 1
<b>Pump station</b>	Pump displacement = 5E-6 m <sup>3</sup> /rad
	Volumetric efficiency = 0.92
	Total efficiency = 0.8
	Nominal pressure = 10 MPa
	Nominal angular velocity = 188 rad/sec
	Nominal kinematics viscosity = 18 cSt
<b>pipeline</b>	Pipe cross section type = circular
	Pipe internal diameter = 0.1 m
	Geometrical shape factor = 64
	Length = 20 km
	Aggregate equivalent of local resistance = 1 m
	Internal surface roughness height= 1.5E-05 m
	Laminar flow upper margin = 2000
	Turbulent flow lower margin = 4000
	Pipe wall type = Rigid
	Specific heat ratio = 1.4
<b>Hydraulic valves</b>	Model parameterization = By maximum area and opening
	Valve passage maximum area = 0.05 m <sup>2</sup>
	Valve maximum opening = 0.5 m
	Flow discharge coefficient = 0.7
	Orifice P-A initial opening = 0 m
	Orifice A-T initial opening = 0 m
	Critical Reynolds number = 12
Leakage area= 1E-12 m <sup>2</sup>	
<b>Simulation time</b>	8226 sec

**Table 3. Scenario A simulation parameters**

Reservoir	Volume Set (m3)	initial volume (m3)
<b>Reservoir Out</b>	Vol <sub>out</sub> (set) = 100	Vol <sub>out</sub> (initial) = 200
<b>Reservoir in</b>	Vol <sub>in</sub> (set) = 50	Vol <sub>in</sub> (initial) = 0.02

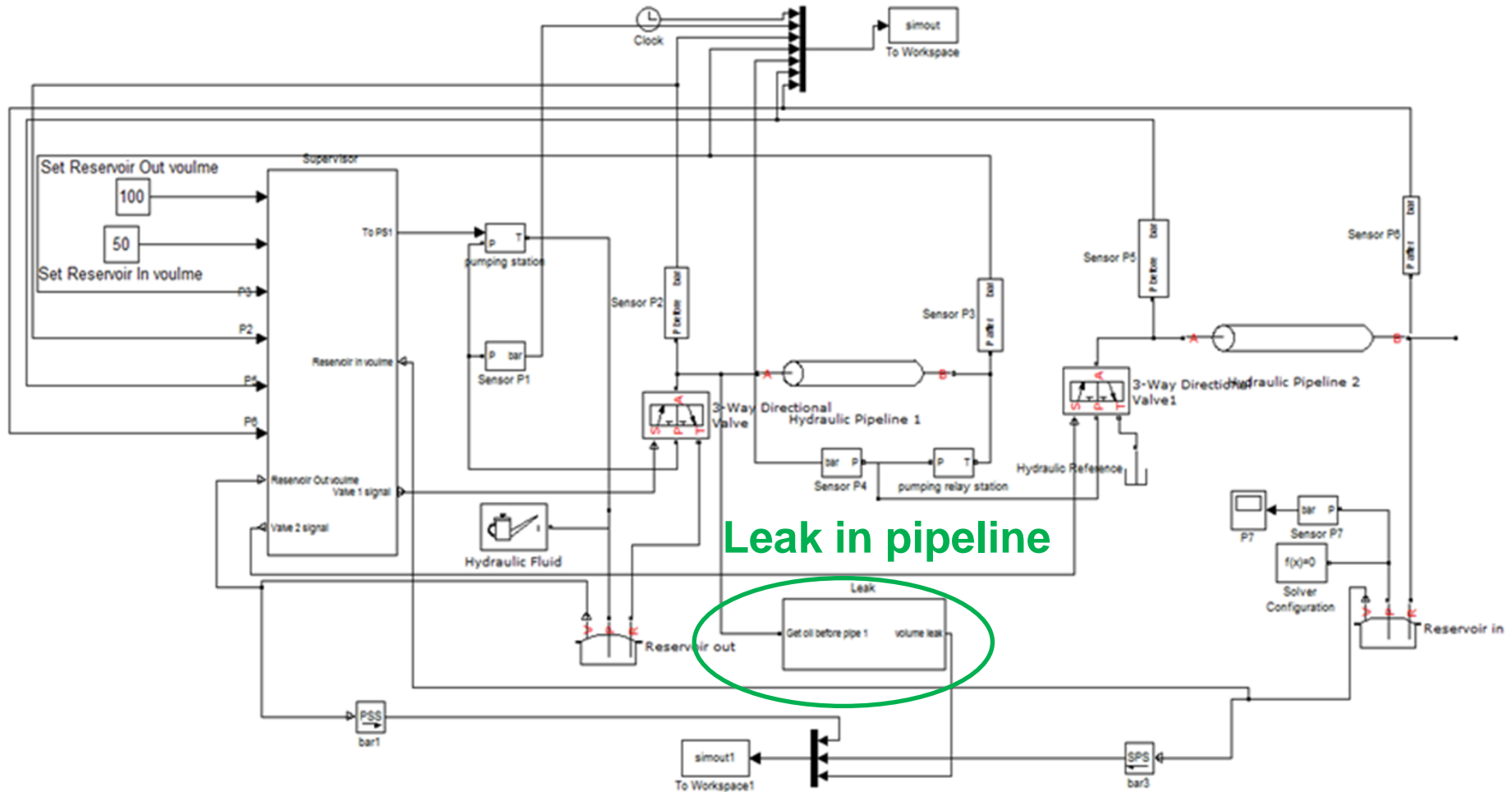
# NF model

Various simulation data were used to create this model which will be the prediction tool for the supervision system.

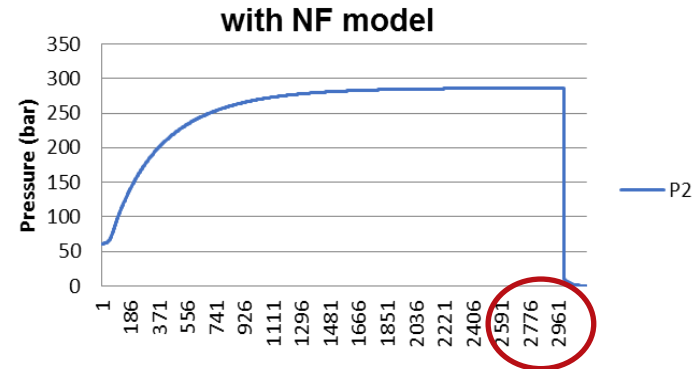
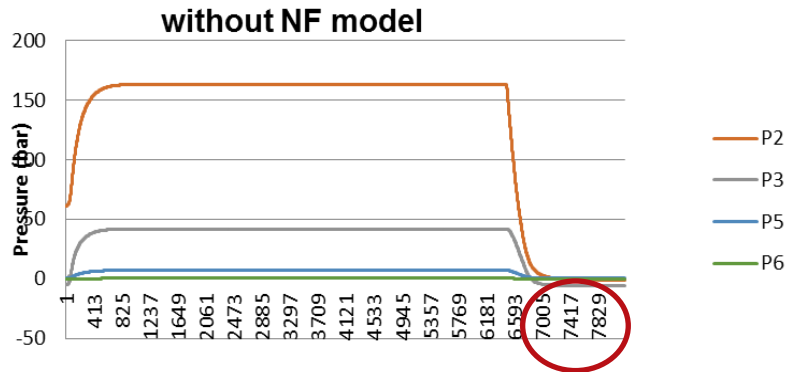


**3D NF Model Surface for the pressure in P2 location**

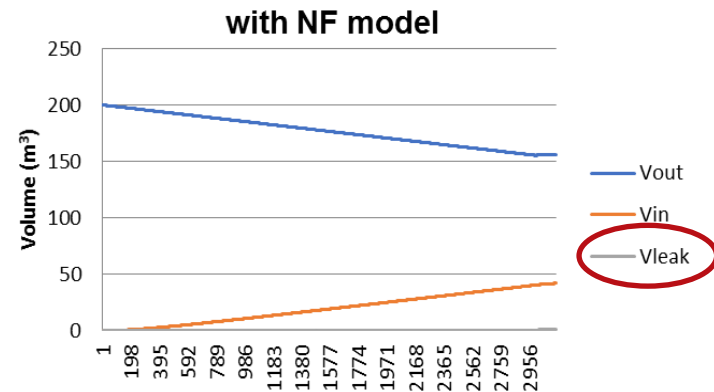
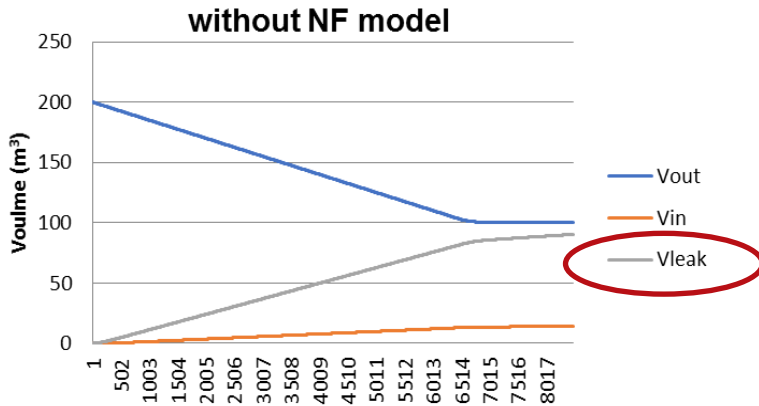
# Stage One: Test



# Stage One Results



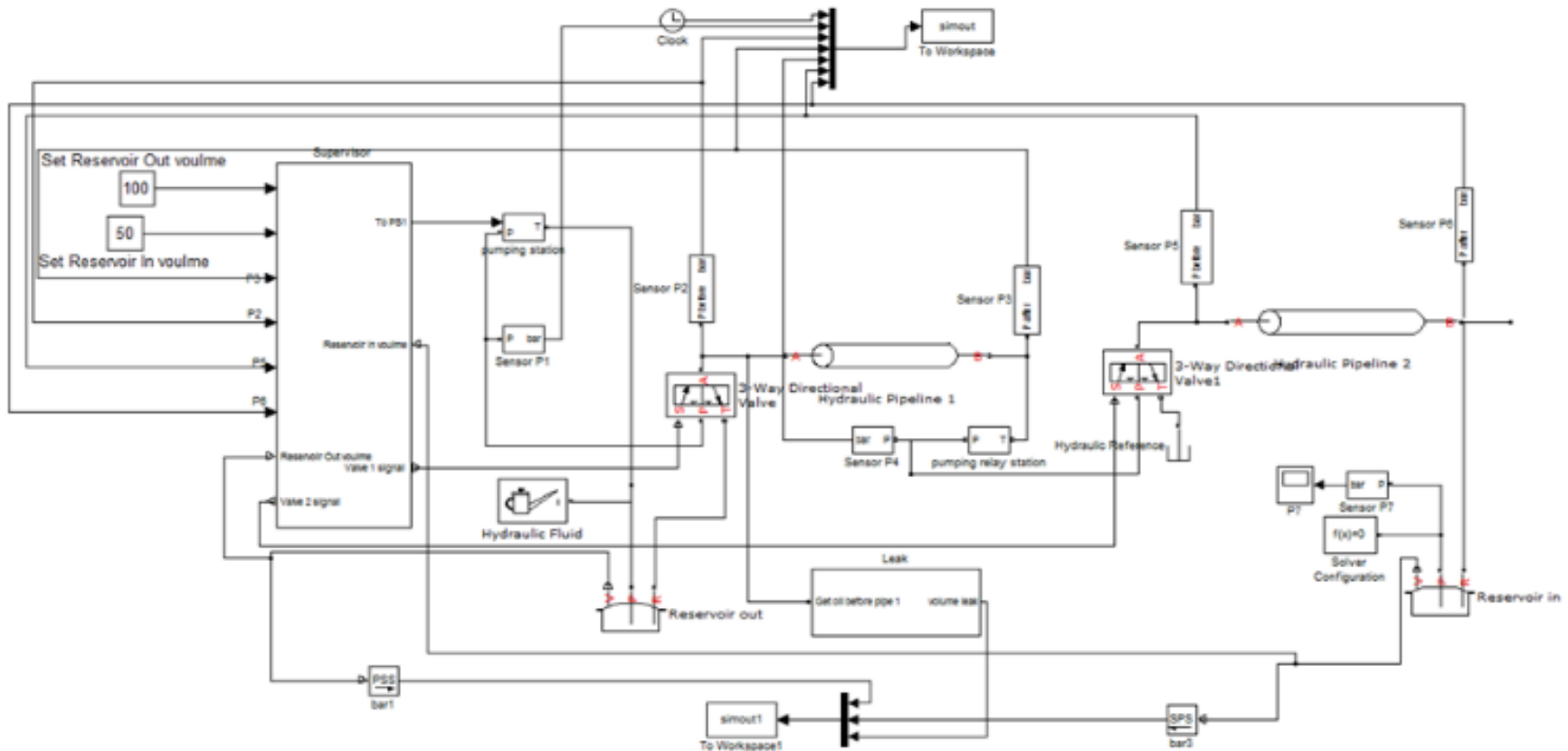
**a) Pressure sensors readings in leak condition**



**b) Volume sensors reading in leak condition**

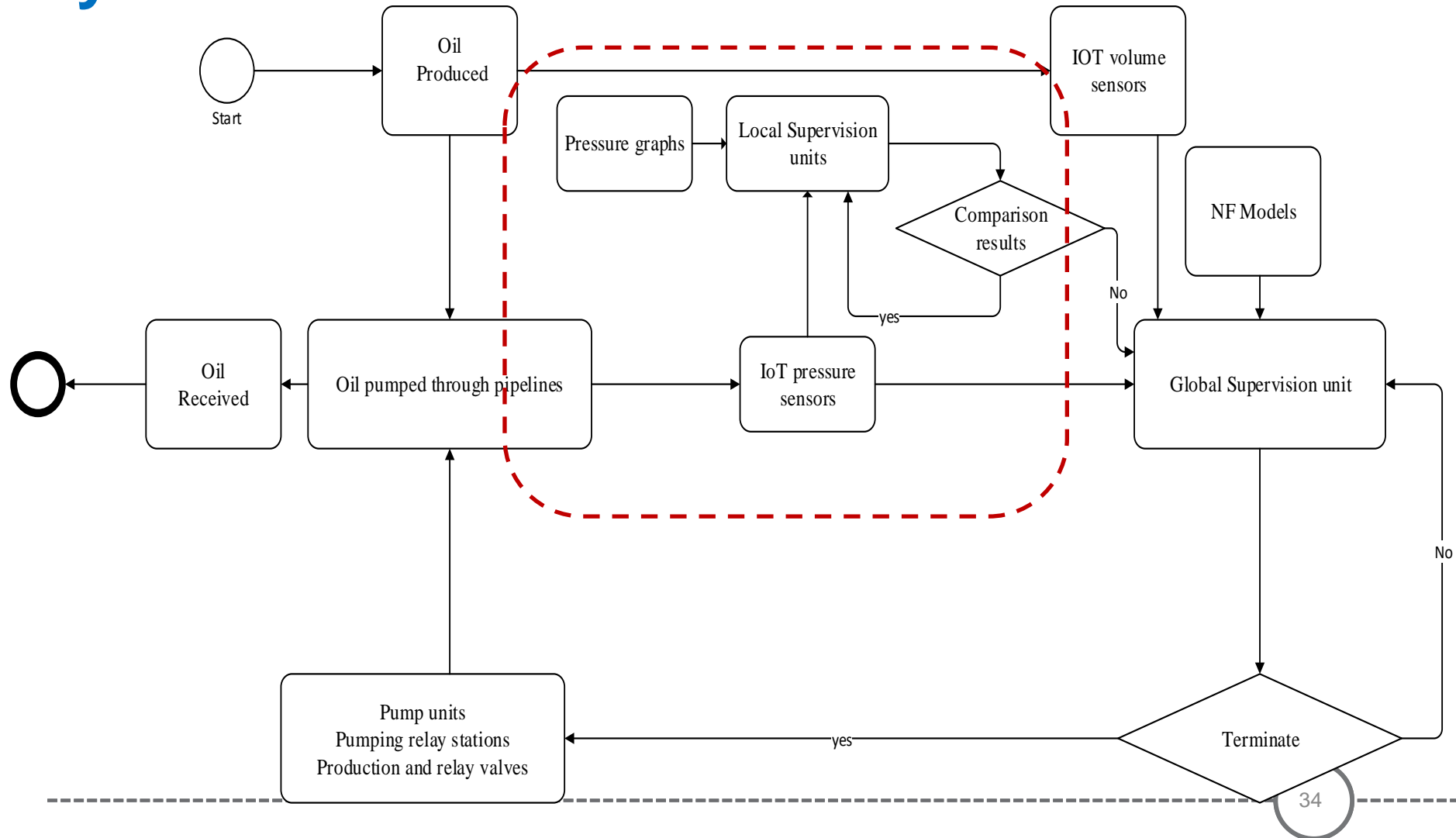
**Pressure and volume sensor readings with and without NF model in leak condition**

# Simulation in Simscape Software Package



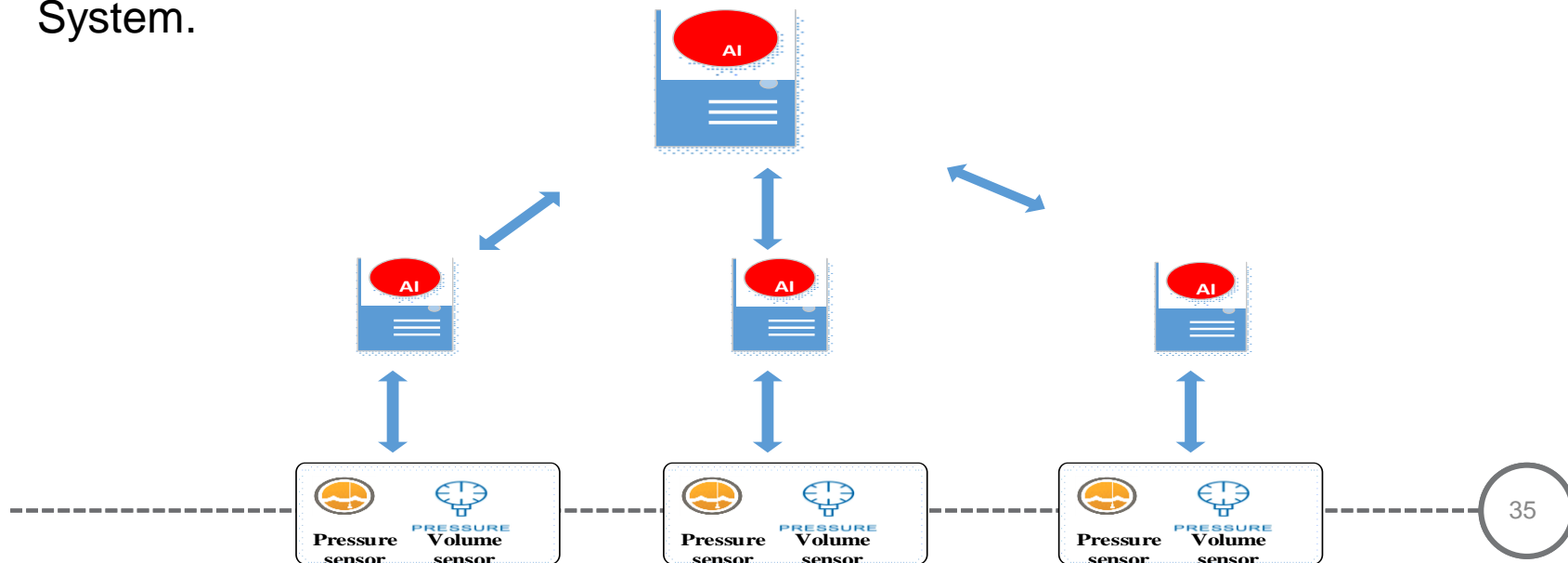
Naghm H. Saeed and Maysam F. Abbod, "Modelling Oil Pipelines Grid: Neuro-fuzzy Supervision System", *International Journal of Intelligent Systems and Applications (IJISA)*, Vol.9, No.10, pp.1-11, 2017. DOI: 10.5815/ijisa.2017.10.01.

# Stage Two: Hierarchy Neuro-fuzzy Supervision System

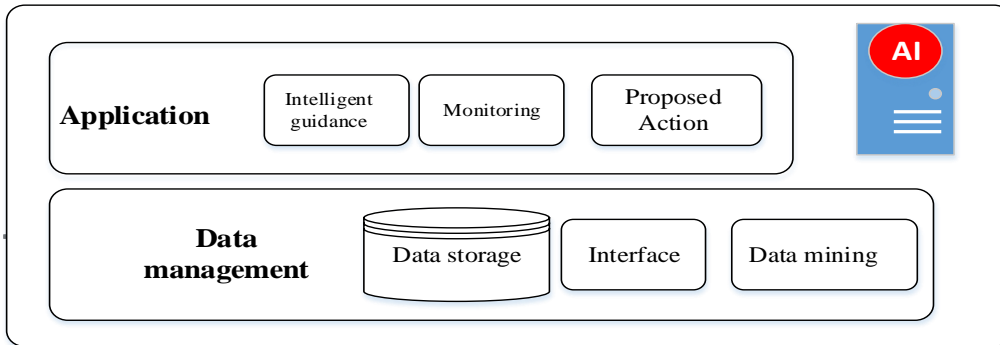


# Stage Two: Hierarchy Neuro-fuzzy Supervision System

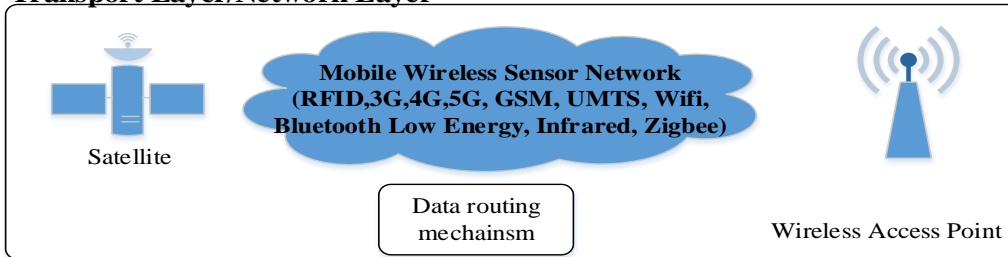
- By adding Local Supervision System units near to the sensors, it is expected it will **reduce unnecessary communication traffic between the Global Supervision system and the process sensors.**
- Decentralising will reduce the load on the Global System and will mean a **reduced impact if a single point of failure (SPOF) occurs** in the Global System.



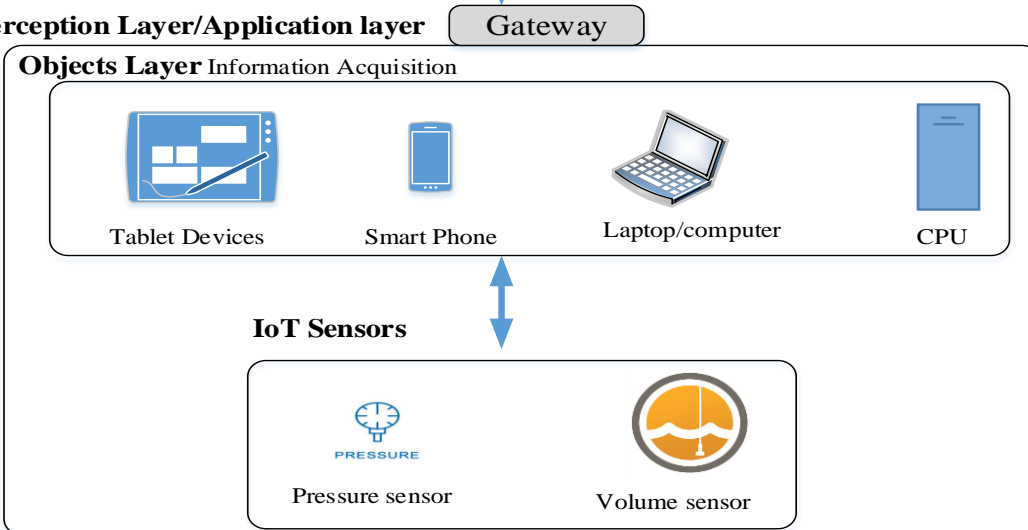
# Stage three; IoT Hierarchy Neuro-fuzzy Supervision System



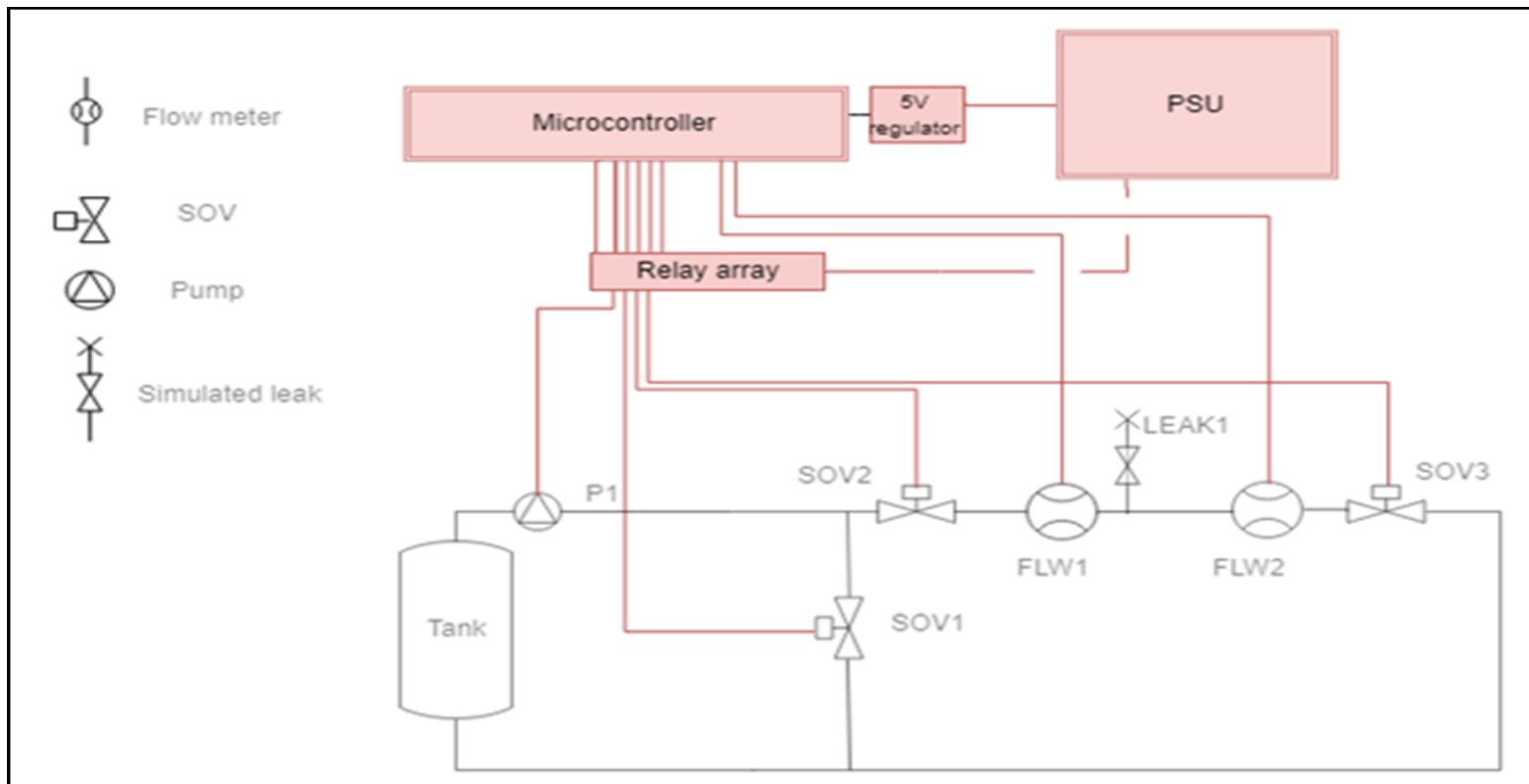
Transport Layer/Network Layer



Perception Layer/Application layer

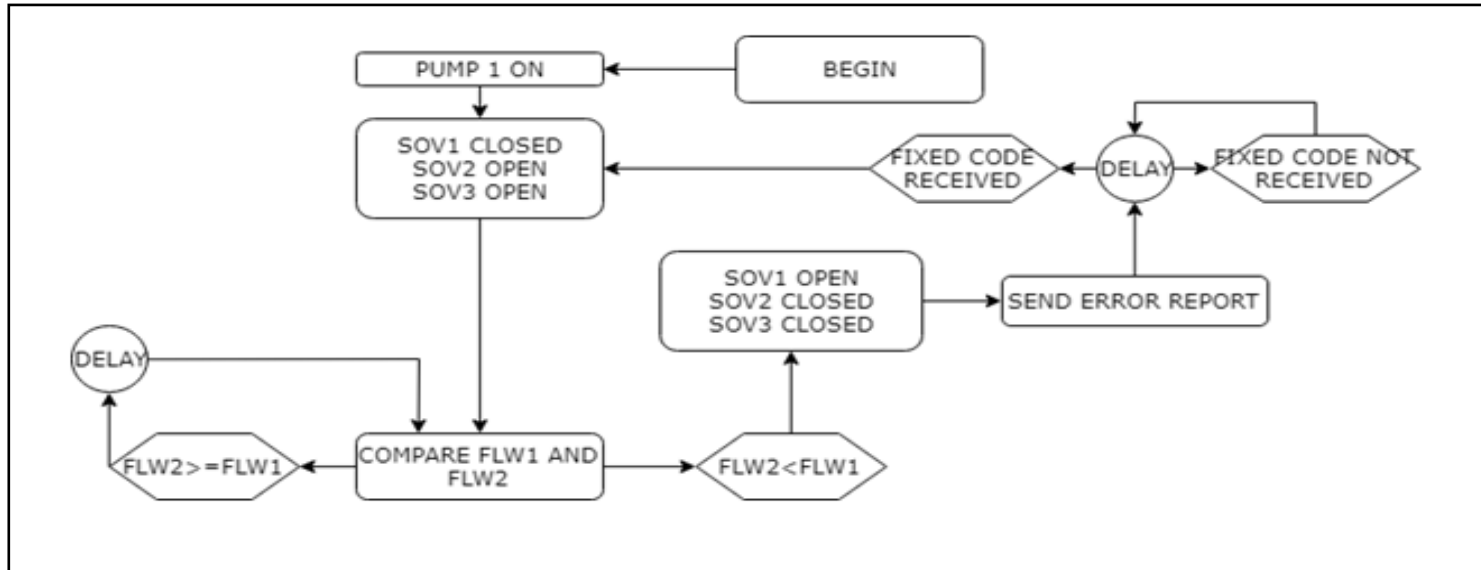


# Monitoring and Controlling Water Pipelines in Buildings



Proposed prototype solution block diagram

# Monitoring and Controlling Water Pipelines in Buildings

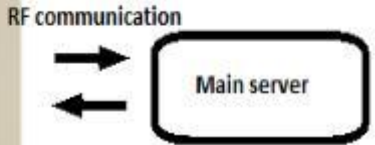


Prototype  
flowchart

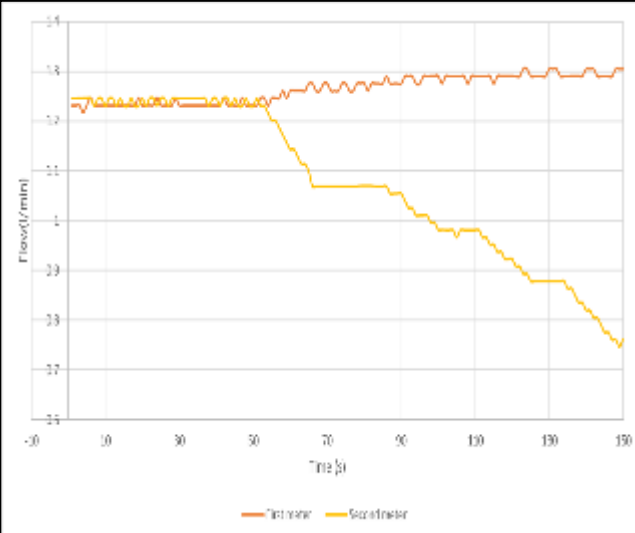
```
setup function{
    begin serial data transmission;
    state I/O pins used;
    nullify variables;
}
loop{
    for 1 second do:
        flow1 = pulseCountInOneSecond / calibrationFactor;
        flow2 = pulseCountInOneSecond / calibrationFactor;
        if flow1 - flow2 > 0 for 5s -> leak();
        else -> no leak;
    }
}
```

Microcontroller  
pseudocode

# Implementation in Progress of Leak Detection System



Flow meter rates comparison graph



# CollaborateCom2019

## CollaborateCom 2019 - 15th EAI International Conference on Collaborative Computing: Networking, Applications and Worksharing

August 19-22, 2019  
London, Great Britain

[Best CollaborateCom paper](#) currently at

**1100** downloads

**5** citations

... and counting!

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### Call for Papers

#### Indexed in

Ei Compendex, ISI Web of Science, Scopus, CrossRef, Google Scholar, DBLP, and more.

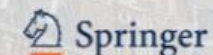
#### Publication

Mobile Networks and Applications (MONET) Journal  
(IF: 2.497)

EAI Endorsed Transactions on Collaborative  
Computing

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#### Publishing Partner



[Collaboratecom2019](#)

Full Paper Submission deadline **31 March 2019**



# CollaborateCom 2019 international conference

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**To be held in August**

## KEYNOTES

- Niki Trigoni a Professor at Oxford University Department of Computer Science and fellow of Kellogg College.
- Professor Tasos Dagiuklas is the leader of the Smart Internet Technologies (SulTE) research group at the London South Bank University where he also acts as the Head of Division in Computer Science. Tasos has 10+ EU projects and received funding of £7+ million,
- Mr Jun Xu is Vice President of Huawei Cloud Division, before he was Vice President of Huawei Enterprise USA in that role.

# EnAppsIoT Workshop

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## Aim

Bring together practitioners and researchers from both academia and industry in order to have a forum for discussion and technical presentations on the **recent advances in application and implementation of the Internet of Things in Engineering**. Researchers are invited to submit their state-of-art work to address the IoT challenges in Engineering application and showcase achievements in the field.

## Topics of interest include, but are not limited to:

- Engineering Applications, including: Smart Grid/Smart Metering; surveillance and Intelligent Transportation Systems.
- Smart House/Neighborhood/City, including: Mobility management, Context awareness, Sustainable design and Industrial use cases showing gaps to be filled by future research

# Current research

## 2. Effective Cardiology Diagnostic learning framework for human electrocardiograms (ECGs) readings

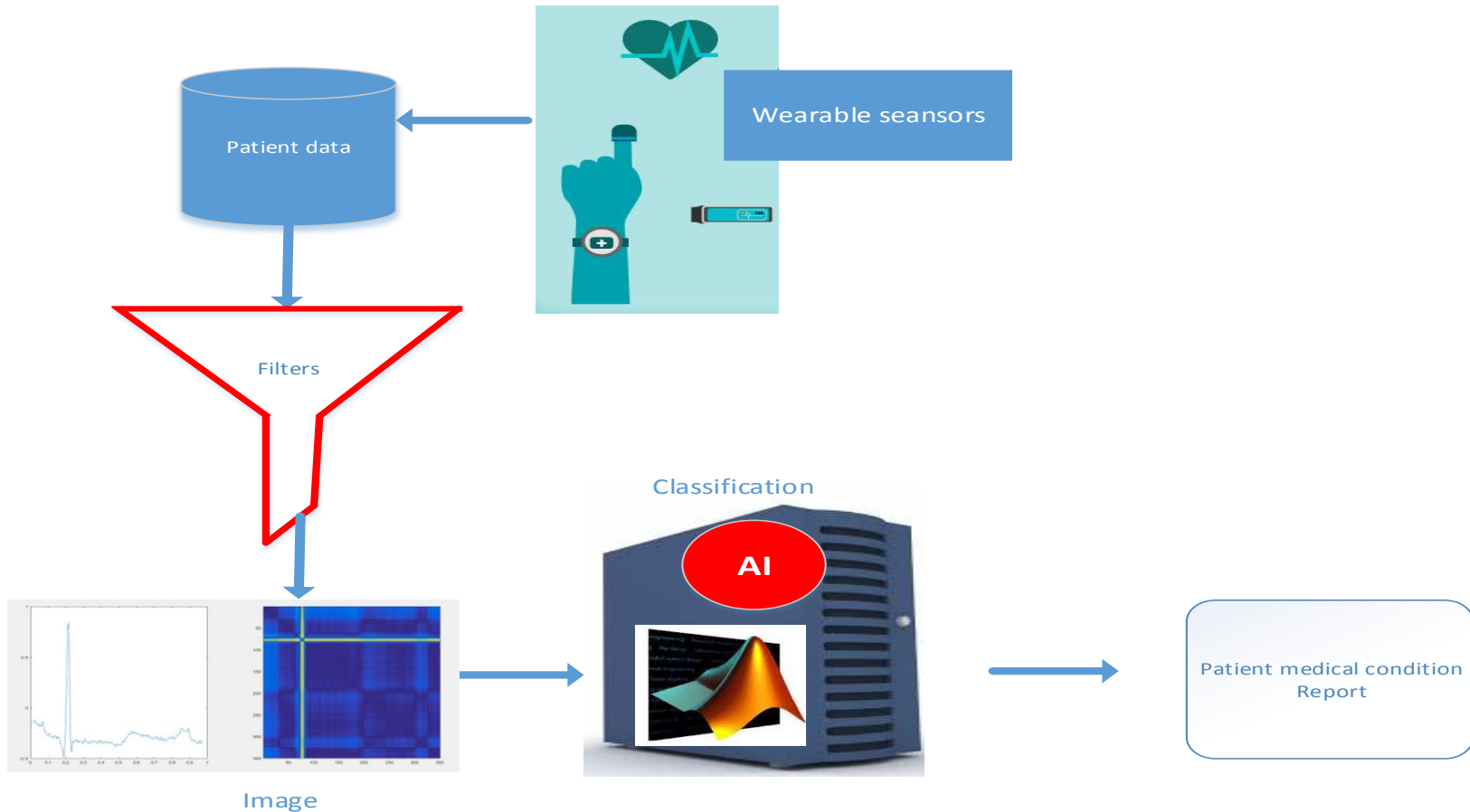
### Motivations :

- Globally, cardiovascular conditions are the **most common cause of death**.
- To **reduce diagnostic and therapeutic errors** that are inevitable in human clinical practice.
- To **improve healthcare quality and outcomes** and providing affordable care in health sector (e.g. NHS).
- To **eliminate inefficiencies** that leads to cost-saving

### Main Research Aim :

Establish and test a diagnostic framework based on Patients Electrocardiograms (ECGs) Readings. The Cardiology framework is a deep learning system based on big data analytics (patient records) and classification

## 2. Deep learning Diagnostic Procedure for Electrocardiograms (ECGs) Readings



# Current research

## 3. Assessment in Education

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### **Motivation:**

- **Improve students' engagement** in their modules, and hence improve the overall quality of their attempt at summative assessment, by using a range of feed-forward techniques.
- **Encourage moving from feedback to feed-forward.** The end of module feedback given to students is difficult to feed-forward into future assessment

### **Main Research Aim :**

The aim is to **evaluative mechanisms and methods** to assess the effectiveness of feed-forward within assessment intervention.

# Research interest

## 4. Renewable Energy Management System

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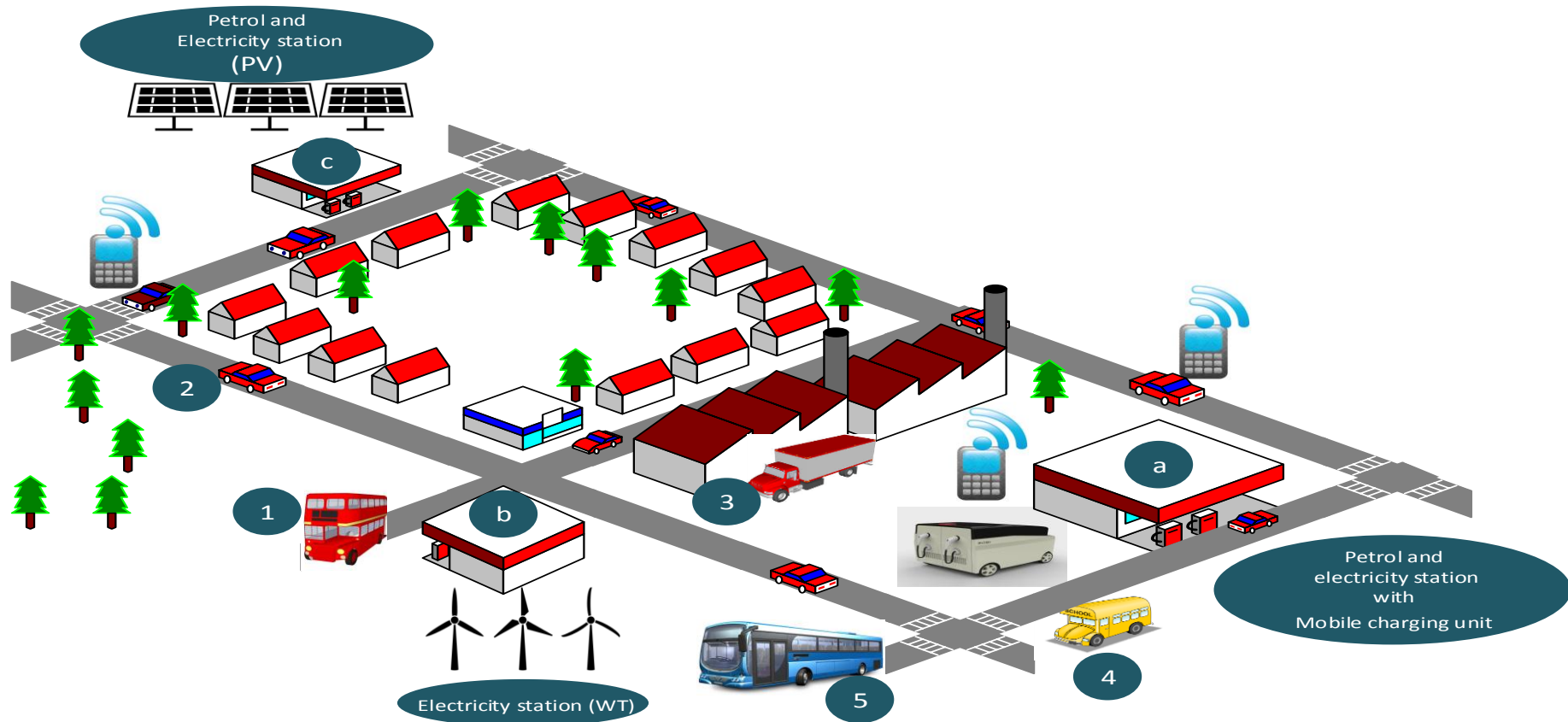
### Motivations :

- **Better quality of service** in Micro Grid (MG) electricity stations. will optimize the electrical vehicle (EV) user time and decide the optimize solution for the driver according of his needs.
- Another step forward to create **smart city**
- **Efficient management system** for EV will encourage more people to own one before 2040.

### Main Research objectives :

**Design and create a management system** for the renewable energy in MG electricity stations with the Support of Artificial Intelligence and Internet of Things (IoT).

# Renewable Energy for Electricity Stations in Micro Grid



**Thank you for listening**  
**Any Questions?**